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ORIGINAL ARTICLE

Plasmid-Mediated Quinolone-Resistance (*qnr*) Genes in Clinical Isolates of *Escherichia coli* Collected from Several Hospitals of Qazvin and Zanjan Provinces, Iran

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Abstract
Objectives: *Escherichia coli* is regarded as the most important etiological agent of urinary tract infections. Fluoroquinolones are routinely used in the treatment of these infections; however, in recent years, a growing rate of resistance to these drugs has been reported globally. The aims of this study were to detect plasmid-mediated *qnrA*, *qnrB*, and *qnrS* genes among the quinolone-nonsusceptible *E. coli* isolates and to investigate their clonal relatedness in Qazvin and Zanjan Provinces, Iran.
Methods: A total of 200 clinical isolates of *E. coli* were collected from hospitalized patients. The bacterial isolates were identified through standard laboratory protocols and further confirmed using API 20E test strips. Antimicrobial susceptibility was determined by the standard disk diffusion method. Polymerase chain reaction (PCR) and sequencing were used for detecting *qnrA*, *qnrB*, and *qnrS* genes and the clonal relatedness of *qnr*-positive isolates was evaluated by enterobacterial repetitive intergenic consensus-PCR (ERIC-PCR) method.
Results: In total, 136 (68%) isolates were nonsusceptible to quinolone compounds, among which 45 (33.1%) and 71 (52.2%) isolates showed high- and low-level quinolone resistance, respectively. Of the 136 isolates, four (2.9%) isolates were positive for the *qnrS1* gene. The results from ERIC-PCR revealed that two (50%) cases of *qnr*-positive isolates were related genetically.
Conclusion: Our study results were indicative of the presence of low frequency of *qnr* genes among the clinical isolates of *E. coli* in Qazvin and Zanjan Provinces, which emphasizes the need for establishing tactful policies associated with infection-control measures in our hospital settings.

1. Introduction

Clinically, *Escherichia coli* is an important Gram-negative bacteria with the potential to cause serious disease including urinary tract infections (UTIs), pyelonephritis, and bacteremia [1]. UTIs, known as the most common hospital-acquired infections, account for up to 35% of infections associated with health-care

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